Does the Bundeswehr learn from its operational experiences?

A Monograph
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The way the Bundeswehr as an organization collects, analyzes and disseminates lessons learned gives critical indications for how effectively the German Army learns as part of the Bundeswehr. This monograph analyzes the lessons learned process by means of normative factors that promote learning in organizations. The more each factor is prevalent in an organizational unit the more opportunity exists for learning. The results show that the lessons learned system is appropriate to provide the necessary and sufficient conditions that allow learning to emerge and flourish. However, the research also reveals barriers to learning that hamper effective organizational learning. Two cost-effective measures might mitigate the effects of these learning barriers. An independent lessons-learned center posted on a case by case basis during major operations would help to facilitate rapid collection and dissemination in theater and the utilization of Web 2.0 technologies would virtually flatten the organizational relationships and speed up the learning cycle.

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Abstract

DOES THE BUNDESWEHR LEARN FROM ITS OPERATIONAL EXPERIENCES? by MAJ (GS) Guenther Daniels, SVC, 46 pages.

The way the Bundeswehr as an organization collects, analyzes and disseminates lessons learned from its operational experiences is not only of utmost significance for force protection and effectiveness in missions but also gives critical indications for how effectively the German Army learns as part of the Bundeswehr. This monograph analyzes the German lessons learned process on the basis of the two most relevant directives of the German Ministry of Defense and Standing Operating Procedures of the Bundeswehr Operations Command. These papers describe in detail purpose, responsibilities, coordination measures, workflow and organizational structure. The research here does not address the issue whether human behavior and leadership culture in the Bundeswehr contribute to its learning capability. That research does not lie within the scope of this study.

The monograph introduces current approaches to organizational learning and identifies ten normative facilitating factors that promote learning. The more each facilitating factor is prevalent in an organizational unit the more opportunity exists for learning. The main discussion focuses on relevant elements that process lessons learned in the Bundeswehr in general and the Army in particular. The elements can be categorized in three groups: elements that acquire information, elements that interpret and disseminate information, and elements that ensure the application of lessons learned. These three categories and their interaction with each other are assessed by means of the identified facilitating factors.

It appears that the German way to acquire, interpret, disseminate and ensure the application of lessons learned fulfills by and large the requirements of the identified facilitating factors. Accordingly, the lessons learned system is appropriate to provide the necessary and sufficient conditions that allow learning to emerge and flourish. However, the research also reveals barriers to learning that hamper effective organizational learning. The authority to release new knowledge and make it available as a lesson learned lies solely with the executive staff of the German Army. The lengthy process and the complicated lessons learned organizational structure hamper rapid collection and dissemination.

Two cost-effective measures might mitigate the effects of these learning barriers. An independent lessons learned center posted on a case by case basis during major operations would help to facilitate rapid collection and dissemination of lessons learned in theater and the utilization of Web 2.0 technologies would virtually flatten the lessons learned organizational relationships and speed up the learning cycle.

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Introduction

On June 7, 2003, in Kabul, Afghanistan, a taxi packed with explosives drew up alongside a bus that was on its way to the International Airport carrying 33 homeward bound German soldiers. The suicide attack killed four and wounded 29 soldiers. This was the first time that German troops were deliberately attacked by a suicide bomber and with a single attack it caused the highest number of casualties since the German Armed Forces deployed troops to missions abroad. After the incident, media questioned why the German Army used commercial buses and unprotected vehicles in an operational environment that is perceived as more violent than the missions in Kosovo and Bosnia. Subsequently, the German Army was reinforced through the acquisition of a broad mix of protected vehicles for all sorts of missions. Today, the German Army utilizes these vehicles wherever possible and appropriate.[1] Six years later, in July 2009, after several patrols were ambushed in recent months, German soldiers in Afghanistan began to operate according to a new set of rules of engagement that allow them to use force preemptively. There had been mounting criticism that the soldiers did not have the necessary authority to defend themselves militarily in threatening situations. Bundeswehr soldiers will now, for the first time, be able to use mortar grenades and armored personnel vehicles in the northern province of Kunduz.[2]

These examples represent one type of organizational learning. Namely, the incidents and implications imposed on the German Army the need to adapt to the operational environment. They are at the same time prominent examples of how an organization should not learn. In the aftermath of the suicide attack, the question was raised who was accountable for the decision that

[1] Carlotta Gall, "Kabul Bombing Kills 4 German Soldiers and Wounds 29," *New York Times*, June 8, 2003, http://www.nytimes.com/2003/06/08/international/middleeast/08KABU.html (accessed August 9, 2009).

[2] Kateri Jochum, "New rules of engagement for German troops in Afghanistan," *Deutsche Welle*, July 26, 2009, http://www.dw-world.de/dw/article/0,,4519627,00.html (accessed August 9, 2009).

led to the use of unprotected vehicles in a violent operational environment. The answer to that question would only provide a specific answer to deal with this specific example. However, these examples may also be a symptom for a more general underlying problem.

The Bundeswehr has not suffered from a shortage of reforms in the past. The Army alone has already undergone four structural reforms since German reunification and the integration of the two German armies. The Bundeswehr is today divided into a military part, the armed forces themselves, and a civil part with the armed forces administration, the federal bureau of procurement and the federal bureau for information management and information technology. Considering that the size of the German Armed Forces is comparable to the size of the United States Marine Corps, it makes sense that the Bundeswehr is concentrating on a capabilities oriented concept as stressed by the Chief of Defense, General Wolfgang Schneiderhan. "The capabilities of our service branches no longer have priority; priority rests with the capabilities of the Bundeswehr as a whole."[3] The White Paper for German Security Policy states: "Depending on operational demands, there will be different levels of capability in the response, stabilization and support forces."[4] The Bundeswehr's new orientation has meant that since 2001 it has been engaged in the most fundamental change since German unification and the transformation of the Bundeswehr is still ongoing. Today, the German Armed Forces consist of not only the three traditional services Army, Navy and Air Force but also of an additional Joint Support Service and the Central Medical Services. These additional services provide support services, like logistics and intelligence, to Army, Navy and Air Force mainly through organizational elements that had been an integral part of the traditional services before the transformation. The efforts to pool services into the Joint Support Service and the Central Medical Services led to a higher demand

[3] Wolfgang Schneiderhahn, "Der Einsatz bestimmt die Wirklichkeit des Bundeswehr-Alltags," *Die Bundeswehr: Magazin des Deutschen Bundeswehrverbandes e.V.*, 12, 2006, 8.

[4] German Federal Ministry of Defense, *White Paper 2006* (Berlin: BMVg, 2006), 107.

for coordination between the services, especially during operations. The new structure led as well to a more distributed structure for the Army's lessons learned system. Consequently, the Bundeswehr, under auspices of the Ministry of Defense, pursues an integrated and joint approach to collecting, interpreting and disseminating lessons learned from operational experiences and exercises.[5] The incidents described earlier suggest that the Bundeswehr's lessons learned structure and the way it processes lessons learned hamper effective organizational learning. However, the way the Bundeswehr as an organization collects, analyzes and disseminates lessons learned from its operational experiences is not only of utmost significance for force protection and effectiveness in missions, but also gives critical indications for how effectively the Bundeswehr learns as an organization.

The research here does not address the issue whether human behavior and leadership culture in the Bundeswehr contribute to its learning capability. That research does not lie within the scope of this study. However, there is no doubt that the nature of learning and the way it takes place are determined in large measure by the culture of an organization.[6] The research assessed the German lessons learned process on the basis of the two most relevant directives of the Ministry of Defense and Standing Operating Procedures of the Bundeswehr Operations Command.[7] These papers describe in detail purpose, responsibilities, coordination measures, workflow and organizational structure.

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[5] Bundesministerium der Verteidigung, *Weisung für die Auswertung von Einsätzen der Bundeswehr* (Berlin: August 3, 2009).

[6] Edgar H. Schein, *Organizational Culture and Leadership: A Dynamic View*, 2nd ed. (San Francisco: Jossey-Bass, 1992).

[7] The relevant papers are: Bundesministerium der Verteidigung, *Weisung zur Auswertung von Einsätzen, einsatzgleichen Verpflichtungen und Übungen im Heer* (Bonn: March 22, 2007); Bundesministerium der Verteidigung, *Weisung für die Auswertung von Einsätzen der Bundeswehr* (Berlin: August 3, 2009); Einsatzführungskommando der Bundeswehr, Stand*ing Operating Procedure (SOP) für die Durchführung Bundeswehrgemeinsamer Auswertung von Einsätzen und einsatzgleichen Verpflichtungen* (Berlin: July 2008).

The two directives of the Ministry of Defense and a Standing Operating Procedure of the Bundeswehr Operations Command describe in detail the Bundeswehr‘s and German Army’s lessons learned process. However, the German organization for capturing and disseminating lessons learned cannot be assessed until a standard has been defined. The standard is found in the current approaches to organizational learning. That literature identifies normative facilitating factors that promote learning. The more each facilitating factor is prevalent in an organizational unit the more opportunity exists for learning.[8] Armed with an understanding of organizational learning concepts it is possible to select the relevant elements that process lessons learned in the Bundeswehr in general and the Army in particular. The identified elements can be categorized in three groups; elements that acquire information, elements that interpret and disseminate information, and lastly elements that ensure application of lessons learned. These three categories and their interaction with each other can then be compared to facilitating factors drawn from organizational learning concepts. That comparison reveals that the Bundeswehr and the German Army are properly organized for learning but that the authority structure impedes the process.

It appears that the German way to acquire, interpret, disseminate and ensure the application of lessons learned fulfills by and large the requirements of the identified facilitating factors. Accordingly, the lessons learned system is appropriate to provide the necessary and sufficient conditions that allow learning to emerge and flourish. However, the research revealed also barriers to learning that constrain effective organizational learning. The authority to release new knowledge and make it available as a lesson learned lies solely with the executive staff of the German Army, the lengthy process and the complicated lessons learned architecture hampers rapid collection and dissemination.

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[8] Anthony J. DiBella and Edwin C. Nevis, *How Organizations Learn*: *An Integrated Strategy for Building Learning Capability* (San Francisco: Jossey-Bass, 1998).

Two measures might eliminate or at least mitigate the effects of these learning barriers. An independent lessons learned center posted on a case by case basis during major operations would help to facilitate rapid collection and dissemination of lessons learned in theater and the utilization of Web 2.0 technologies would virtually flatten the lessons learned organizational relationships and speed up the learning cycle.

Best Practices to Enhance Organizational Learning

The German military has a long standing tradition of analyzing operational lessons that reaches back to the times of the Prussian reformer Gerhard von Scharnhorst. Scharnhorst recognized the importance of drawing conclusions from the in-depth study of historical battles and he ensured that lessons learned would come to the attention of a broader audience. He established institutions to train staff officers and laid the foundations for the Prussian General Staff.[9] Today, the Bundeswehr's lessons learned system for capturing, interpreting and disseminating of operational experiences is described by directives of the Ministry of Defense and in more detail by Standing Operating Procedures of the Bundeswehr Operations Command. The Bundeswehr uses management consultants to utilize best practices and it implemented in 2002 a comprehensive software tool to produce a database and deployed an information system to process lessons learned. The Bundeswehr also continuously improves this process.[10] Therefore, one can infer that the German lessons learned process is well established.

Nevertheless, the mistakes observed earlier and the so-called van-Heyst-report written by seven retired German admirals and generals suggest that the Bundeswehr does not learn

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[9] John A. Lynn, *Nations in Arm: The Cambridge History of Warfare* (New York: Cambridge University Press, 2005), 208.

[10] For example, the last change of the framework directive *Weisung für die Auswertung von Einsätzen der Bundeswehr* became effective on August 3, 2009 and replaced a version from January 14, 2007.

effectively from its operational experiences and that there may be factors that are barriers to learning.[11] The question, therefore, is not whether or not the Bundeswehr learns from its operational experiences. The Bundeswehr surely does! Rather, the question is how effective is the learning process and does new knowledge fall on fertile ground? Guidance to answer this question can be found in organization theory's discipline of organizational learning.

The theoretical foundations of organizational learning go back to the late 1950s and Bertalanffy's General Systems Theory.[12] Since then, research and theory building have centered on organizations as social systems, organizations as information processing systems, organizations as interpretative systems, and organizations as inquiring systems.[13] However, the subject 'organizational learning' gained much attention by a broad audience in the 1990s, especially after the publication of Peter Senge's book 'The Fifth Discipline'.[14] In the six years after its first publication in 1990, over 100 articles and several books were published on the topic of 'the learning organization.' Management consultants could barely cope with the huge interest from companies, and governmental and non-governmental organizations. Senge's work in particular was highly influential because it offered for the first time a comprehensive and holistic approach for practitioners who wanted to transform their organization towards a learning organization. The idea of a learning organization seemed to be at that time the answer to an array of challenges, like globalization, growing economic competition, environmental and ecological

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[11] Rolf Clement, "Von wegen 'Joint Forces': eine siebenköpfige Kommission ehemaliger hochrangiger Generale und Admirale hat die Organisation und Befehlsstruktur der Auslandseinsätze analysiert," *Loyal: Magazin für Sicherheitspolitik*, no. 3 (2008): 18-19.

[12] Ludwig von Bertalanffy, *General Systems Theory* (New York: George Braziller Inc., 1968).

[13] Philip H. Mirvis, "Historical Foundations of Organization Learning," *Journal of Organizational Change Management*, no. 9 (1996).

[14] Peter M. Senge, *The Fifth Discipline*: *The Art & Practice of The Learning Organization* (New York: Currency Doubleday, 1994).

pressures, and the beginning of the knowledge era.[15] In other words, the ideal of the learning organization was the answer to ever-changing conditions in a complex world.

According to Peter Senge, learning organizations are those in which people continually expand their capacity to create new patterns of thinking and where they continually learn how to function together as a team.[16] David Garvin's definition of a learning organization is more suitable for this study and reflects the typical process of a lessons learned system: "A learning organization is an organization skilled at creating, acquiring, interpreting, transferring, and retaining knowledge, and at purposefully modifying its behavior to reflect new knowledge and insights."[17] It is important to note the difference between the terms *learning organization* and *organizational learning*. The term 'learning organization' focuses on the *what*, and describes the systems, principles, and characteristics of an organization that learns and produces as a collective entity. 'Organizational learning' on the other hand, refers to *how* organizational learning occurs, i.e. the skills and processes of building and utilizing knowledge. Organizational learning as such is just one dimension or element of a learning organization.[18]

Formal organizational systems for capturing and disseminating lessons learned emerged with the popularization of organizational learning concepts as a new field of study in the early 1990s. Knowledge management incorporates many organizational concepts. However, while organizational learning research stresses organizational processes, knowledge management

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[15] Michael J. Marquardt, *Building the Learning Organization*: *A Systems Approach to Quantum Improvement and Global Success* (New York et al, McGraw-Hill: 1996), 3.

[16] Peter M. Senge, *The Fifth Discipline: The Art & Practice of The Learning Organization* (New York: Currency Doubleday, 1994).

[17] David A. Garvin, *Learning in Action*: *A Guide to Putting the Learning Organization to Work* (Boston, Harvard Business School Press: 2000), 11.

[18] Michael J. Marquardt, *Building the Learning Organization*: *A Systems Approach to Quantum Improvement and Global Success* (New York et al, McGraw-Hill: 1996), 19.

research emphasizes managerial processes associated with knowledge creation, elicitation, analysis, storage, and dissemination.[19]

In this monograph, 'lessons learned system' refers to the whole of organizational units, technologies, people, activities, and products that support the collection, interpretation and dissemination of lessons learned in an organization. Lessons learned systems may focus on 'negative' lessons; failures, deficiencies, and other problems to be avoided, or on 'positive' lessons; innovative techniques and 'best practices' to be emulated. The intended benefits of implementing formal processes are to contribute to improved effectiveness and facilitate an organization's adaptation to a changing environment. These benefits occur through the modification of an organization's habits of action which might be reflected in changes to informal and tacit operational routines or in revisions to formal and explicit standing policies, operating procedures, or regulations.[20]

Facilitating Factors for Learning

Based on the fact that the Bundeswehr has had for years a well-established formal system for capturing and disseminating lessons learned, the research sought to find possible underlying causes that might hamper the organizational learning capability of the Bundeswehr. A formalized process may ensure the acquisition, dissemination and application of lessons learned. However, there are additional factors that influence the learning process and determine if learning occurs effectively and if new knowledge is readily utilized. Publications on knowledge management, organizational learning, and learning organizations in particular discuss such factors. Research

[19] Frank J. Barrett and Keith F. Snider, *Dynamics of Knowledge Transfer in Organizations: Implications for Design of Lessons learned System* (Monterey, CA, Naval Postgraduate School: 2001), 2.

[20] Ibid., 2.

shows, the more learning facilitators are prevalent in an organization the more opportunity exists for learning. Having more opportunities enhances the learning capability.[21]

A description of conditions that promote learning can be found in a variety of publications. The factors presented here are based primarily on the works of Peter Senge, DiBella and Nevis, and David Garvin who are practitioners in the field of building learning capacities in organizations. These authors and others name facilitating factors as normative elements. The normative elements represent the conditions or practices that promote learning in organizations. These factors are:

- *An involved leadership* – Leaders must engage in the implementation of lessons learned, including being visible in the organization as a model for the learning effort.
- *A systems perspective* – The organization cannot learn when it focuses on short-term results and ignores the long-term consequences of its actions.
- *Scanning* - is an organization's scouting function; it provides the stimulation and direction of knowledge generation.
- *Creative tension or awareness of a performance gap* – It is crucial that organizational members have a shared awareness that there is a difference between the organization's desired and actual performance.
- *A concern for measurement* – As part of feedback systems, measures help managers decide whether they are on course or if corrections are needed.
- *An organizational curiosity* – This factor fosters an environment in which people are encouraged to try out things on an ongoing basis.
- *A climate of openness* – This is related to the permeability of information boundaries and the degree to which opportunities to observe and to participate are available to everyone.
- *Continuous education* – is the internalization of a commitment to lifelong education at all levels of the organization.
- *Operational Variety* – If an organization manifests several ways of doing something or has flexible work rules, its members can see different means to an end.
- *Multiple advocates* – are essential in order for knowledge to be effectively utilized.

As normative elements, these facilitating factors represent the conditions or practices that promote organizational learning along the stages of learning or, in other words, the learning process. There is a common understanding in organizational learning research that the general learning process encompasses three stages: information acquisition, interpretation and

[21] Anthony J. DiBella and Edwin C. Nevis, *How Organizations Learn*: *An Integrated Strategy for Building Learning Capability* (San Francisco: Jossey-Bass, 1998).

dissemination, and application of knowledge. [22] In the first stage, data, observations, and facts must be gathered and put into context. Questions to ask in this stage are: What information should be acquired by whom, from where and how? The second stage is to interpret the information collected by putting it into context. This stage serves as a sense-making mechanism and enriches information with perspectives, positions and a better contextual understanding. Critical questions at this stage are: What does the information mean, can the information be categorized, and are there cause-and-effect relationships identifiable? Dissemination transfers the new understanding or new knowledge to the last stage, which is the application or use of information. Eventually, the interpreted information should result in activities and behaviors that reflect the newly acquired knowledge about a specific context.[23] Additionally, research shows that some facilitating factors are more important than others during these stages. Table 1 gives an overview of what factors are most influential at a specific stage.[24]

[22] Anthony J. DiBella and Edwin C. Nevis, *How Organizations Learn*: *An Integrated Strategy for Building Learning Capability* (San Francisco: Jossey-Bass, 1998), 28.

[23] David A. Garvin, *Learning in Action*: *A Guide to Putting the Learning Organization to Work* (Boston, Harvard Business School Press: 2000), 20-21.

[24] Ibid., 42.

	Stages of Learning		
	Information Acquisition	Interpretation and Dissemination	Application
Facilitating Factors	Involved Leadership	Involved Leadership	Involved Leadership
	Systems Perspective	Systems Perspective	Systems Perspective
	Scanning Imperative	Climate of Openness	Multiple Advocates
	Performance Gap	Continuous Education	Operational Variety
	Concern for Measurement		
	Organizational Curiosity		

Table 1: Influencing Facilitating Factors at the Learning Stages

The table above shows that the first two facilitating factors, leadership and systems perspective, are equally important at all stages of the learning process. Scanning, an awareness of a performance gap, a concern for measurement and an organizational curiosity support information acquisition. A climate of openness and a commitment to lifelong learning facilitates interpretation and dissemination, while multiple advocates of new knowledge and operational variety are particularly helpful in ensuring new knowledge is applied. The table shows that when studying how an organization learns attention must be directed toward assessing the organization's leadership and perspective.

Role of Leadership and a Systems Perspective

Strong leadership is often a key factor in driving knowledge acquisition. It sends to any level of the organization a clear message about what is important to learn. Good leaders grasp this intuitively and frequently know how to get people to attend to an issue. However, leaders often fail to understand how important it is for them to be involved in knowledge dissemination and utilization. Leaders then find that knowledge developed or created at great expense is not broadly

used or does not serve as a springboard for application in new settings. "We are told over and over that knowledge dissemination and knowledge utilization are more problematic than knowledge acquisition."[25] Often the problem is that leaders are less involved at those later stages. Peter Senge has written much about the importance of leadership in setting a vision that mobilizes enhanced performance.[26] However, the findings of DiBella and Nevis indicate that merely creating vision is not enough. For truly assimilated, actionable learning to occur, leaders need to be early adopters and students of the knowledge. They must engage in directly implementing the vision and must be visible models for learning in the organization. In short, it makes a huge difference at any level of an organization if those in leadership positions can demonstrate that they have learned what they want others to learn. Thus, an involved leadership means learning for the leader as well as providing a stimulus for others to learn.

The factor named systems perspective refers to the ability of organizational leaders to think in terms of whole systems and the interdependence of parts. When leaders lack a systems perspective their actions often lead to unanticipated consequences. Time lags and delays between the parts of a system mean that long-term results usually differ from short-term ones. Leaders cannot learn when they focus on short-term results and ignore the long-term consequences of their actions.[27] Senge considers this discipline to be the one that integrates all the others in his five-factor model of the learning organization.[28] As with an involved leadership, lack of a strong systems perspective is a barrier to successful dissemination and utilization of knowledge. Even if good leadership helps to produce knowledge acquisition in particular areas, robust learning will

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[25] Anthony J. DiBella and Edwin C. Nevis, *How Organizations Learn*: *An Integrated Strategy for Building Learning Capability* (San Francisco: Jossey-Bass, 1998), 76.

[26] Peter M. Senge, *The Fifth Discipline: The Art & Practice of The Learning Organization* (New York: Currency Doubleday, 1994), 150.

[27] Anthony J. DiBella and Edwin C. Nevis, *How Organizations Learn*: *An Integrated Strategy for Building Learning Capability* (San Francisco: Jossey-Bass, 1998), 79.

[28] Peter M. Senge, *The Fifth Discipline: The Art & Practice of The Learning Organization* (New York: Currency Doubleday, 1994), 10.

not occur without this perspective. Organizational learning is limited when staff cannot recognize the relationships among processes, structures, and dispersed actions.[29] Therefore, the facilitating factors leadership and systems perspective are bound together. They are essential for learning at every phase of the learning cycle from the acquisition of information to the application of new knowledge. The rest of the factors are relevant to all phases as well but facilitate a specific stage of learning more than others. These factors will be discussed at the respective stage of the Bundeswehr's lessons learned process.

The Bundeswehr Lessons learned Process in Light of Theory

The Bundeswehr Operations Command plays a crucial role in the lessons learned process because it is the hub for Germany's operations abroad. In co-operation with the troop-contributing commands of all the military organizational areas and with the Federal Office of Defense Administration, the Bundeswehr Operations Command ensures personnel and materiel readiness for Germany's missions abroad. It arranges for supplementary or replacement personnel and for all the goods and services required to sustain the contingents. From a purely national perspective, the Bundeswehr Operations Command represents the operational level and the German contingents on operations constitute the tactical level. The guidelines set forth in operational level missions, orders and directives are implemented by the contingents at the tactical level.[30]

The Bundeswehr Operations Command has no forces under its administrative control within Germany. Rather, it has command and control of the units that the service commands place under its operational control for the duration of an operation, but only from when they

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[29] Peter M. Senge, *The Fifth Discipline: The Art & Practice of The Learning Organization* (New York: Currency Doubleday, 1994), 298.

[30] Einsatzführungskommando der Bundeswehr, *Einsatzführungskommando der Bundeswehr*, 3rd ed. (Berlin: August 2007), 8-9.

arrive in their theater of operations. The Bundeswehr Operations Command closely co-operates with the troop-contributing Commands of the Army, Air Force, Navy, Medical Service and Joint Support Service as well as with the Federal Office of Defense Administration. The Command defines the capabilities required for an operation. During this phase, the units concerned remain under the command and control of their service commands and conduct the deployment training under their own responsibility.[31]

For the phases that follow deployment, the Bundeswehr Operations Command issues regulations governing the higher-level co-ordination and synchronization of the deployment of the often heterogeneous German forces and, if necessary, multinational elements to the theater of operations. The Service Commands that contribute troops then move their personnel to set points of transfer. The Bundeswehr Operations Command is responsible for the establishment and maintenance of operational readiness as soon as they arrive in the theater of operations. The German contingents may then also be placed under the operational and tactical control of multinational headquarters. The troop-contributing service commands, however, remain responsible for the personnel and materiel readiness of their sub-contingents, taking care of matters from the home base.[32] Figure 1 illustrates the crucial role of the Bundeswehr Operations Command and shows that the Bundeswehr's lessons learned process follows exactly the stages of learning introduced in the preceding section.[33]

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[31] Einsatzführungskommando der Bundeswehr, *Einsatzführungskommando der Bundeswehr*, 3rd ed. (Berlin: August 2007), 10.

[32] Ibid., 11.

[33] Einsatzführungskommando der Bundeswehr, *Standing Operating Procedure (SOP) für die Durchführung Bundeswehrgemeinsamer Auswertung von Einsätzen und einsatzgleichen Verpflichtungen* (Berlin: July 2008), 8.

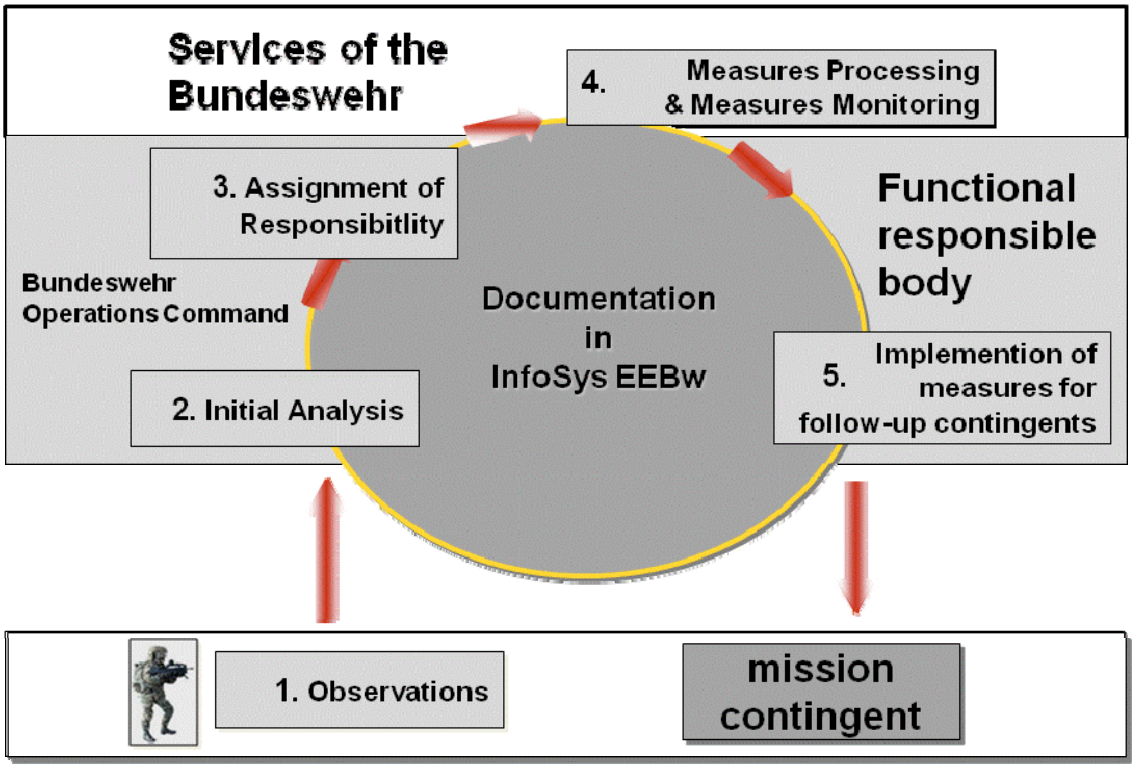

Figure 1: Acquisition – Interpretation and Dissemination – Application

The mission contingent reports their observations in various forms, like field reports, war diaries, and reports of expert teams to the Bundeswehr Operations Command. The command conducts an initial analysis and decides if and what form of action has to be taken. Consequently, it assigns responsibility to one or more services of the Bundeswehr. If the contingent lacks a needed capability, respective troop-contributing commands and the Federal Office of Defense Administration try to find a solution. Observations may also be addressed by recording best practices or even altering doctrinal publications. The Operations Command finally implements the new measures for follow-up contingents and if possible, for the current contingent.[34] The following sections present the Bundeswehr's learning cycle in more detail and analyze the lessons learned process.

[34] Einsatzführungskommando der Bundeswehr. *Standing Operating Procedure (SOP) für die Durchführung Bundeswehrgemeinsamer Auswertung von Einsätzen und einsatzgleichen Verpflichtungen* (Berlin: July 2008), 9.

Information Acquisition

The latest directive for the analysis of Bundeswehr operations, *Weisung für die Auswertung von Einsätzen der Bundeswehr*, is dated August 3,2009 and subsumes under the general term Operations Quality three different quality aspects of an operation.

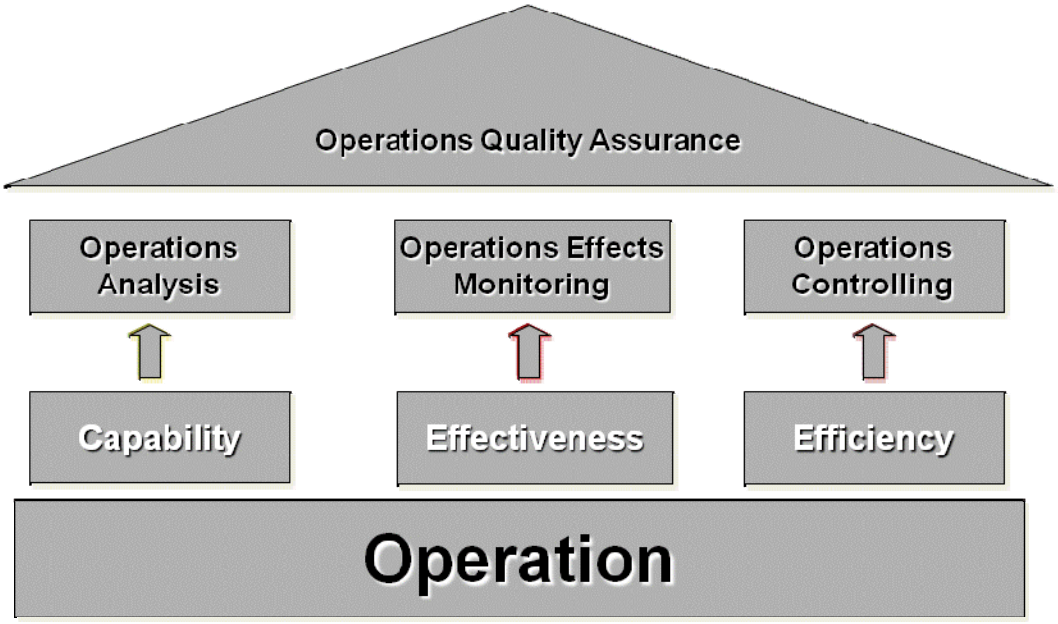

Figure 2: Overview Operations Quality

As Figure 2 shows, operations quality unifies operations controlling, effects monitoring, and operations analysis. [35] Operations effects monitoring is intended to objectify progress made during on-going operations and over a specific time-span. Additionally, effects monitoring supports leadership processes by identifying clear measures for effectiveness. The quality aspect of operations control evaluates the long-term efficiency of operations across several contingents. It utilizes performance indicators to draw conclusions on the efficiency of the operations. Lastly, operations analysis focuses on capabilities and seeks the answer to questions like; what failures,

[35] Bundesministerium der Verteidigung, *Weisung für die Auswertung von Einsätzen der Bundeswehr* (Berlin: August 3, 2009), 3.

deficiencies, and other problems should be avoided, what innovative techniques and best practices can be emulated in the future, and what future capabilities have to be developed or must be improved?[36] Operations analysis is, therefore, the core of the Bundeswehr's lessons learned system.

DiBella and Nevis argue that sound learning occurs only if an organization constantly scans the environment for information. It promotes a foundation of enhanced consciousness and a thorough understanding of one's environment.[37] Furthermore, if an organization only relies on a few data sources and does not value new insights, it limits the range and depth of its knowledge.[38] To engage in scanning does not imply that an organization will simply borrow from or adapt what others are doing. Scanning is a way of sensing developing problems or opportunities and acting on them early rather than waiting until a problem is full-blown or a window of opportunity has closed. Therefore, scanning is an organization's scouting function because it provides the stimulation and direction for knowledge generation.[39] Conceptually, the Bundeswehr pursues a two-fold approach to collect information although the two approaches complement each other. The first one is a top-down approach with clearly defined subjects for study, the so-called Bundeswehr Top List (Bw Top List). The Bw Top List encompasses subjects that are particularly relevant in medium- or long-term perspective for the Bundeswehr transformation and Bundeswehr planning. The Bundeswehr leadership and representatives of the troop-contributing commands of all the military organizational areas as well as the Federal Office of Defense Administration are involved in the formulation of the Bw Top List. The Bw Top List addresses

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[36] Bundesministerium der Verteidigung, *Weisung für die Auswertung von Einsätzen der Bundeswehr* (Berlin: August 3, 2009), 3.

[37] Anthony J. DiBella and Edwin C. Nevis, Edwin, *How Organizations Learn: An Integrated Strategy for Building Learning Capability* (San Francisco, Jossey-Bass: 1998), 63.

[38] David A. Garvin, *Learning in Action*: *A Guide to Putting the Learning Organization to Work* (Boston, Harvard Business School Press: 2000), 42.

[39] Anthony J. DiBella and Edwin C. Nevis, Edwin, *How Organizations Learn: An Integrated Strategy for Building Learning Capability* (San Francisco, Jossey-Bass: 1998), 63.

issues that are commonly recognized as Bundeswehr shortfalls. Two examples out of the Bw Top List in 2008 are the subjects 'counter insurgency' and 'mobile command posts.' Mission contingents are tasked to gather information and report experiences on these subjects to contribute to a broad body of knowledge.[40]

The bottom-up approach encompasses all standardized reports by the mission contingent but it is not limited to it.

During conduct of mission	End of term
Daily national reporting	Field reports
War diaries	Supervision visits
Operations analysis officers	Questionnaires and interviews
Quick looks	Debriefings
Best practice	Lessons Learned conferences
Analysis- and Expert teams	Analysis of multinational field reports
Questionnaires and interviews	

Table 2: Ways of Information Collection

Table 2 shows various ways with which the Bundeswehr collects a contingent's experiences during and after their mission tour. Reports include for example war diaries, field reports, and daily contingent reports. Another form of collecting information in the field is the assignment of theater observer officers. Theater observer officers are tasked to observe specific events or the introduction of new processes and materiel. The Bundeswehr introduced the concept of theater observer officers for the introduction of a new weapon system in 2007.[41] Furthermore, surveys

[40] Bundesministerium der Verteidigung, *Weisung für die Auswertung von Einsätzen der Bundeswehr,* (Berlin: August 3, 2009), 11.

[41] Michael Kämmerer, "Qualitätsmanagement der Streitkräfte," *Denkwürdigkeiten: Journal der Politisch-Militärischen Gesellschaft*, no. 38 (2007): 5.

and interviews during and after missions, reports after supervisory visits, debriefings and lessons learned conferences contribute to the collection of information.[42] In short, the Bundeswehr makes use of an array of sources to collect information on the status of a mission, a mission's processes, and issues in order to identify gaps in knowledge, best practices and ways for improvement. The procedure indicates that the Bundeswehr scans its operational environments for information constantly to improve its conduct of mission, while the two-fold approach ensures the involvement of leadership at every level and furnishes proof of a systems perspective. The Bw Top List addresses matters that are relevant for the future of the organization and it focuses the information collecting elements on topics they would probably spend less attention on during their regular conduct of operations.

A shared understanding of what and where the organization has to improve is another critical factor during the acquisition of information. Here, performance gap is the recognition by organizational members that there is a difference between the organization's desired performance and actual performance. Peter Senge identifies this gap as source of creative energy. He speaks of a 'creative tension' that exists when a vision and current reality do not overlap.[43] When feedback shows a gap between desired and actual performance, leaders respond with actions they hope will correct the problem. DiBella and Nevis claim that "the potential for learning is proportional to how widely performance gap concerns are shared."[44] However, three kinds of problems often act as barriers to recognizing or responding to a performance gap. First, the use of the wrong kinds of measures to identify critical performance factors may act as a barrier and second, the lack of a

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[42] Einsatzführungskommando der Bundeswehr, *Standing Operating Procedure (SOP) für die Durchführung Bundeswehrgemeinsamer Auswertung von Einsätzen und einsatzgleichen Verpflichtungen* (Berlin: July 2008), 11-12.

[43] Peter M. Senge, *The Fifth Discipline: The Art & Practice of The Learning Organization* (New York: Currency Doubleday, 1994), 150.

[44] Anthony J. DiBella and Edwin C. Nevis, *How Organizations Learn*: *An Integrated Strategy for Building Learning Capability* (San Francisco: Jossey-Bass, 1998), 65.

systems perspective from which the problem must be studied. The third wrong kind of measures may occur when a long period of positive performance causes people to become complacent and resistant to critical self-examination. It also leads to easy rationalizations or 'theories of exceptional happenings' when negative, possibly disconfirming, feedback is perceived. Awareness of a performance gap – either through analysis of performance shortfalls or a new vision – opens the door to learning by providing the initial awareness that new knowledge needs to be generated or that something needs to be 'unlearned.' To produce action the perception of a performance gap must be shared within the organization.[45] The Bw Top List itemizes elements the Bundeswehr leadership commonly considers to be important performance gaps of the Bundeswehr. Additionally, daily communication and reports in a variety of forms ensures a constant flow of information.

The intentional setup of the two-fold approach and lessons learned scanning elements suggests that organizational curiosity exists as well. This factor refers to support for trying new things, curiosity about how things work, and the ability to “play around” with new methods, and procedures. Organizational curiosity fosters an environment in which people are encouraged to try out things on an ongoing basis. With the assumption that experience creates learning, it follows that engaging in more kinds of experiences will lead to more learning. The concept of continuous improvement derives from similar reasoning; it assumes that the way things are done today may not be the way they will be done tomorrow.[46] A willingness to embrace contradictory, unexpected findings cannot be developed and maintained if people are punished when they try something new and it fails or is less effective than the old way. Some organizations deal with this problem by creating parallel systems in which new ways are tried out while the old is kept in

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[45] Anthony J. DiBella and Edwin C. Nevis, *How Organizations Learn*: *An Integrated Strategy for Building Learning Capability* (San Francisco: Jossey-Bass, 1998), 66.

[46] David A. Garvin, *Learning in Action*: *A Guide to Putting the Learning Organization to Work* (Boston, Harvard Business School Press: 2000), 38.

place to minimize disruption and as insurance. An example for such parallel systems is the method of Concept Development and Experimentation, which the Bundeswehr has also adopted.[47]

All organizations measure performance one way or another and in doing so accept the general measurement practices that are customary in their company or industry. As part of feedback systems, measures help leaders decide whether they are on course or if corrections are needed. In this sense, measurement is part of any adaptive learning system. However, studies have shown that some organizations view measurement as part of a learning process rather than as purely for monitoring and control. In these instances, leaders discuss the need for metrics that will give them new and different information.[48] Military leaders do not need to be convinced of the importance of measurement. They need to be motivated to see the value of approaching a problem with an open mind concerning what needs to be measured and how their involvement in metric development provides a learning experience. The two above mentioned aspects of monitoring effects and controlling operations prove a deep concern for measurement. Overall, the Bundeswehr lessons learned process exhibits all facilitating factors that are relevant to the first stage of organizational learning: an involved leadership, a systems perspective, the scanning imperative, awareness of performance gaps, and a concern for measurement and organizational curiosity.

Interpretation and Dissemination

The second stage of the learning cycle is to interpret the information collected by putting it into context. This stage serves as a sense-making mechanism and enriches information with

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[47] Sönke Marahrens et al., "Experimentieren für die Zukunft der Bundeswehr," *Europäische Sicherheit: Politik, Streitkräfte, Wirtschaft, Technik,* no. 7 (2008): 72.

[48] Anthony J. DiBella and Edwin C. Nevis, *How Organizations Learn*: *An Integrated Strategy for Building Learning Capability* (San Francisco: Jossey-Bass, 1998), 67.

perspectives, positions and a better contextual understanding. Dissemination transfers the new understanding or new knowledge to the last stage, which is the application or use of information. Knowledge is generated when we give meaning to information or experience. For the learning cycle to be engaged, agents of information acquisition must give meaning to information so that the creation of knowledge provides a basis for action. It is not sufficient to have the information in a lessons learned database. Organizational members must have a shared basis for interpreting that information and giving it meaning. Since the Bundeswehr is continually collecting operational experiences and, thus, creating or acquiring knowledge, the potential for learning is always there. To utilize that potential, the Bundeswehr has the capacity to disseminate and use that knowledge. Understanding the learning process at an organizational level means focusing not only on what information is being shared but where the information comes from and who is doing the sharing. The utilization of knowledge depends not only on its perceived relevance but also its social legitimacy. The point is that the contribution of knowledge to learning will depend on who is the source of the knowledge in the first place.[49] In the Bundeswehr's process, generally no written product that is related to assessments of failure and deficiencies or best practices leaves the contingent without being reviewed by the German contingent commander and by his national staff. Accordingly, the commander and his staff constitute the last interpretation authority in theater before information is being released to the Bundeswehr Operations Command for further analysis.[50] An important facilitating factor in this context is a climate of openness. This factor is related to the permeability of information boundaries and the degree to which opportunities to observe and to participate are available to organization members. When there are tight controls

[49] Anthony J. DiBella and Edwin C. Nevis, *How Organizations Learn*: *An Integrated Strategy for Building Learning Capability* (San Francisco: Jossey-Bass, 1998), 31.

[50] Einsatzführungskommando der Bundeswehr. *Standing Operating Procedure (SOP) für die Durchführung Bundeswehrgemeinsamer Auswertung von Einsätzen und einsatzgleichen Verpflichtungen* (Berlin: July 2008), 9.

over information or rigid rules about who belongs at planning and problem-solving meetings, only a few are allowed to participate in the largest number and variety of events and only a few are provided with rich learning opportunities. A climate of openness requires that people have the freedom to express their views and that there is a permissible level of disagreement and debate. If the organizational climate is such that a high degree of politeness and conformity are rewarded, many potentially important views will not be made available.

Related to openness is the extent to which mistakes are shared and not hidden.[51] Chris Argyris has made the argument that organizational learning is severely hampered by managers' widespread habit of acting defensively, of covering up or hiding errors to avoid punishment.[52] It is difficult to improve the climate of openness because deeply entrenched assumptions about trust and control are strong barriers. In some cases improvement requires a leap of faith that can only succeed if supported by the actions of senior leaders who model openness and trust and do not punish staffs who share information about problems or errors.[53] Errors, mistakes, and occasional failures must be accepted if learning is to occur. When flawed information, biased interpretations, or differences between espoused and actual behavior exist, corrections will be suggested only if one is certain that the leadership will not "shoot the messenger" bringing unwanted news. This is perhaps the most important condition supporting learning. This appreciation is supported by Edgar Schein's findings that reveal that the nature of learning and the way it takes place are determined in large measure by the culture of an organization.[54] The problem is human nature. Organizations face a difficult dilemma because of the fact that 'everyone wants to learn, but

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[51] David A. Garvin, *Learning in Action: A Guide to Putting the Learning Organization to Work* (Boston, Harvard Business School Press: 2000), 39-40.

[52] Chris Argyris and Donald Schön, *Organizational Learning: A Theory of Action Perspective,* (Reading, et al., Addison-Wesley Publishing Company: 1978).

[53] David A. Garvin, *Learning in Action*: *A Guide to Putting the Learning Organization to Work* (Boston, Harvard Business School Press: 2000), 41.

[54] Edgar H. Schein, *Organizational Culture and Leadership*: *A Dynamic View,* 2nd ed. (San Francisco, Jossey-Bass: 1992).

nobody wants to be wrong.' Candor is needed on precisely those topics that people prefer to avoid. David Garvin sees three conditions that are essential: a culture that does not demand infallibility and perfection; freedom to fail without punishment or penalty; and systems or incentives that encourage the identification, analysis, and review of errors.[55] The Army directive for the analysis of operations states as a principle that reports with lessons learned have to be disseminated rapidly and *unfiltered*.[56] Although these reports are classified, sometimes such reports leak out to journalists as happened with the field report of the 17th German Afghanistan contingent in December 2008. Alexander Szandar, a journalist for the Spiegel magazine, wrote that the contingent commander, Brigadier General Weist, listed 320 deficiencies and called for 'urgent improvements'. Szandar also mentioned in his article that the way Weist's report was written did not sugarcoat the findings of the 17th contingent.[57] Given the Army directive that encourages a candid handling of lessons learned and Brigadier General Weist's report, the evidence supports the conclusion that the Bundeswehr possesses a climate of openness. However, openness has another component. Openness refers also to the permeability of information boundaries and the degree to which opportunities to observe and to participate are available to organization members. Here, the Bundeswehr process appears to have a weakness.

As depicted in figure 1, the Bundeswehr Operations Command ensures the documentation of identified lessons and assigns responsibility for handling to one or more of the services by means of an information system, called lessons learned information system from operations of the Bundeswehr (*Informationssystem Einsatzerfahrungen der Bundeswehr - InfoSys*

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[55] David A. Garvin, *Learning in Action*: *A Guide to Putting the Learning Organization to Work* (Boston, Harvard Business School Press: 2000), 40-41.

[56] Bundesministerium der Verteidigung, *Weisung zur Auswertung von Einsätzen, einsatzgleichen Verpflichtungen und Übungen im Heer* (Bonn: March 22, 2007), 2.

[57] Alexander Szandar, "German Troops Bemoan 'Critical' Deficits in Training and Equipment," *Spiegel online international*, August 31, 2009, http://www.spiegel.de/international/world/0,1518,646085,00.html (accessed September 5, 2009).

EEBw). The InfoSys EEBw serves as a tool for documenting, monitoring progress, and eventually for disseminating lessons learned. Generally, all military units of the Bundeswehr at home and in theater have read access to the information system EEBw via the Bundeswehr intranet. However, the official dissemination; that is, the release of knowledge and its classification as 'lesson-learned', does not take place until the Ministry of Defense approves the release. Until then, only departments that are concerned with evaluating the identified lessons and departments concerned with measuring, processing, and monitoring have full access to the information.[58] This means that as long as the potential lesson is under examination, the authority to release the knowledge lies solely with the Army division of the Ministry of Defense, in particular with the executive staff of the German Army (*Führungsstab des Heeres*).[59] While reports with shortcomings are apparently written in an open and frank style, there are at the same time strong information boundaries in effect. This suggests that there are tight controls over information and rigid rules about who belongs in problem-solving teams.

The annual planning conferences to develop the Bw Top List, biannual lessons learned conferences, and constant review of reports, debriefings and interviews keeps the leadership at all levels involved in the process. The Army and the Bundeswehr as a whole pursues short-term, mid-term and long-term measures with its approach to learning from experiences. Immediate measures may alter the way of providing logistics, alter the organization, or spur short-term acquisition of materiel. At the same time, the Bundeswehr considers mid- and long-term solutions as well, which may result in changes to materiel procurement, doctrine, and more generally the

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[58] Einsatzführungskommando der Bundeswehr, *Standing Operating Procedure (SOP) für die Durchführung Bundeswehrgemeinsamer Auswertung von Einsätzen und einsatzgleichen Verpflichtungen* (Berlin: July 2008), 8.

[59] Bundesministerium der Verteidigung, *Weisung zur Auswertung von Einsätzen, einsatzgleichen Verpflichtungen und Übungen im Heer* (Bonn: March 22, 2007), 3.

transformation of the Bundeswehr.[60] This leads to the conclusion that a systems perspective and involved leadership are required in the second stage of the learning process, too.

The facilitating factor continuous education refers to the internalized commitment to lifelong education at all levels of the organization. To constantly develop organizational learning capability is to engage in an ongoing never-ending process. It is all but impossible to accept the notion of knowledge as a competitive weapon without realizing that learning does not end. Peter Senge's discipline of 'personal mastery' is another way of looking at this factor.[61] An indicator of this factor is the extent to which these values permeate the entire organization, not just the training and development function.[62] The achievement of a high level of continuous education requires work settings that support learning of all kinds, ranging from on-the-job and apprenticeship experiences to company-supported individual initiatives to seek out knowledge and improve skills. The Bundeswehr embraces the idea of life-long learning and makes sure, that lessons learned are available for everybody who has access to the Bundeswehr intranet. Lessons learned are published in the InfoSys EEBw and are integrated in future doctrine, concepts in development, regulations and tools of the trade publications. Moreover, all lessons learned are incorporated in mission training programs at all levels. The fact that each commander, his staff, and each unit receive proper centralized training in preparation before deployment ensures that lessons learned are being disseminated.[63] This leads to the final stage of learning; the actual application of lessons learned.

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[60] Bundesministerium der Verteidigung, *Weisung zur Auswertung von Einsätzen, einsatzgleichen Verpflichtungen und Übungen im Heer* (Bonn: March 22, 2007), Appendix 2.

[61] Peter M. Senge, *The Fifth Discipline: The Art & Practice of The Learning Organization* (New York: Currency Doubleday, 1994), 115.

[62] Ibid., 120.

[63] Bundesministerium der Verteidigung, *Weisung zur Auswertung von Einsätzen, einsatzgleichen Verpflichtungen und Übungen im Heer* (Bonn: March 22, 2007), Appendix 1 and Appendix 2.

Application of Lessons learned

Knowledge may be generated and disseminated throughout an organization, but the learning cycle remains incomplete unless new knowledge is used to alter decisions or behavior. Although involved leadership is a prerequisite for enhancing the acquisition, dissemination, and utilization of knowledge, effective use of knowledge requires multiple advocates. Unless a significant number of people act as role models and promote new knowledge, the knowledge base will not be broadly used. When acting alone, change or learning advocates can too easily be dismissed as deviants or malcontents. The greater the number of advocates who promote a new idea and the greater the number of 'gatekeepers' who bring knowledge into the system, the more rapidly and extensively will true organizational learning take place. To make any skill or piece of knowledge useful to members of the organization generally, a number of respected key members of the organization must be seen as using it and trying to influence others regarding its value. Advocates serve several purposes. In addition to being 'preachers', they serve as role models for others to observe. This supports generalization of the learning to new situations. Also, the more people who promote a leaning mode, the more learning in general is encouraged.[64] Developing multiple advocates in military organizations is not as problematic as in private organizations because the military principle of 'orders and obedience' supports compliance. It is, therefore, important to find evidence for the application of new knowledge in current orders instead of singling out a particular example where new knowledge has been applied. The major commands of the German Army are the Army Office (*Heeresamt*) in Cologne and the Army Forces Command (*Heeresführungskommando*) in Koblenz. The Army Office is the superior authority for all supporting elements of the Army, such as schools and education centers while the Army Forces Command in Koblenz exercises command and control over all combat units. The Army's

[64] Anthony J. DiBella and Edwin C. Nevis, *How Organizations Learn*: *An Integrated Strategy for Building Learning Capability* (San Francisco: Jossey-Bass, 1998), 78.

directive for analysis of lessons learned from operations directs its two major commands to implement lessons learned; in training, exercises, regulations, and guidelines. The directive is very explicit when it comes to the application of lessons learned and the utilization of new knowledge from operational experiences.[65] The Army Forces Command is responsible for the implementation of short-term requirements. The command is also the single point of contact for the Bundeswehr Operations Command's processing of potential lessons learned. The directive requires that lessons learned have to be implemented in exercises and training, especially in preparation for operations. Lastly, the directive makes the Army Forces Command responsible for the development of further directives in order to ensure the application of lessons learned for all subordinate units.[66] The Army Office is responsible for the implementation of mid-term and long-term requirements for the German Army. The Army Office is also accountable for all Army doctrine, regulations and training directives. Additionally, the Army Office contributes to further conceptual development of the Army in general and its capabilities in particular.[67] The military principle of 'orders and obedience' and the precise orders of the Ministry of Defense ensure multiple advocates for lessons learned.

The German Army's preferred leadership concept is that of '*Führen mit Auftrag*' or in Anglo-American military circles better known as *Auftragstaktik*. Similar to U.S. Army's Mission Command but still less prescriptive, *Auftragstaktik* itself facilitates achieving operational variety, another facilitating factor. Operational variety complements the factor organizational curiosity in that it implies that there is more than one way to accomplish work goals. It assumes that an organization that supports variation in strategy, policy, process, structure, and personnel is more adaptable when unforeseen problems arise. It provides more options and, perhaps even more

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[65] Bundesministerium der Verteidigung, *Weisung zur Auswertung von Einsätzen, einsatzgleichen Verpflichtungen und Übungen im Heer* (Bonn: March 22, 2007), Appendix 1.

[66] Ibid., Appendix 1.

[67] Ibid., Appendix 1, 2.

importantly, allows for the development of multiple role models. If an organization manifests several ways of doing something or has flexible work rules, its members can see different means to an end. This pluralism helps to enhance learning in a way that an absolutist approach does not. Operational variety is an extremely important factor in organizational learning capability because it provides an opportunity to understand the implications and consequences of different ways of working.[68]

Here comes *Auftragstaktik* into play. It is an integral part of the Bundeswehr's leadership philosophy 'Leadership Development and Civic Education' (*Innere Führung)* and is taught from the very beginning of a soldier's career. *Innere Führung* is an obligatory foundation for the actions of every soldier during routine duty and on operations, in both national and multinational structures. All soldiers must base their conduct and actions on the principles of *Innere Führung* according to German Joint Service Regulation 10/1 *Innere Führung*.[69] It is an important element of the leadership culture of the Bundeswehr and comprises guidelines for the leadership, training and education of Germany's Army.[70] *Auftragstaktik* provides freedom of action for subordinates and is only limited by indispensable guidance necessary to fulfill the mission. *Auftragstaktik* is, therefore, far more than a single set of rules of leading forces. Single occasions in which military leaders act independently do not sufficiently prove the existence of the leadership concept. What makes the difference is the consequent application of those principles even in garrison duty. From the standpoint of the traditional organizational concepts of predictability and efficiency, operational variety is an annoyance. It is much harder to discipline and control staff when they

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[68] David A. Garvin, *Learning in Action*: *A Guide toPutting the Learning Organization to Work* (Boston, Harvard Business School Press: 2000), 41.

[69] Bundesministerium der Verteidigung, *ZDv 10/1 Innere Führung: Selbstverständnis und Führungskultur der Bundeswehr* (Bonn: January 28, 2008), 18.

[70] Ibid., 14.

value multiple approaches and flexibly interpret the rules and vary from best practice.[71] However, Joint Service Regulation 10/1 *Innere Führung* unmistakably states; "Leadership must allow freedom of action, active participation and shared responsibility. For this reason, superiors must give top priority to *Auftragstaktik*. In doing so, they must sometimes accept solutions that differ from their own."[72] Subsequently, the leadership principle '*Führen mit Auftrag*' is clearly an enabler for operational variety.

As in the latter phase, leadership is involved at all levels in the process of applying lessons learned. The Army pursues short-term, mid-term and long-term measures in its effort to learn from experiences. Immediate measures may alter the way of providing logistics, alter the organization in general, or spur short-term acquisition of materiel, so called *Einsatzsofortbedarf*. At the same time, the Bundeswehr as a whole considers mid- and long-term solutions as well; this may result in changes to materiel procurement, doctrine, and more generally the future transformation of the Bundeswehr.[73] This leads to the conclusion that the facilitating factors systems perspective and involved leadership are eventually inherent in all stages of the Bundeswehr's learning process. It appears that the German way to acquire, interpret, disseminate, and apply lessons learned fulfills by and large the requirements for organizational learning. Accordingly, the lessons learned system provides the necessary and sufficient conditions that allow learning to emerge and flourish. Nevertheless, there are some barriers to learning.

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[71] Anthony J. DiBella and Edwin C. Nevis, *How Organizations Learn: An Integrated Strategy for Building Learning Capability* (San Francisco, Jossey-Bass: 1998), 67.

[72] Bundesministerium der Verteidigung, *ZDv 10/1 Innere Führung: Selbstverständnis und Führungskultur der Bundeswehr* (Bonn: January 28, 2008), 25.

[73] Bundesministerium der Verteidigung, *Weisung zur Auswertung von Einsätzen, einsatzgleichen Verpflichtungen und Übungen im Heer* (Bonn: March 22, 2007), Appendix 2.

Towards an Agile and Adaptive Army

The new structure of the Bundeswehr and the capabilities-oriented approach led to the complex lessons learned architecture depicted in Figure 3. The graphic, representing a synopsis of the lessons learned process, makes clear that the price for pooling services in specialized organizations resulted in a high demand for coordination and reconciliation under the auspices of the Ministry of Defense.

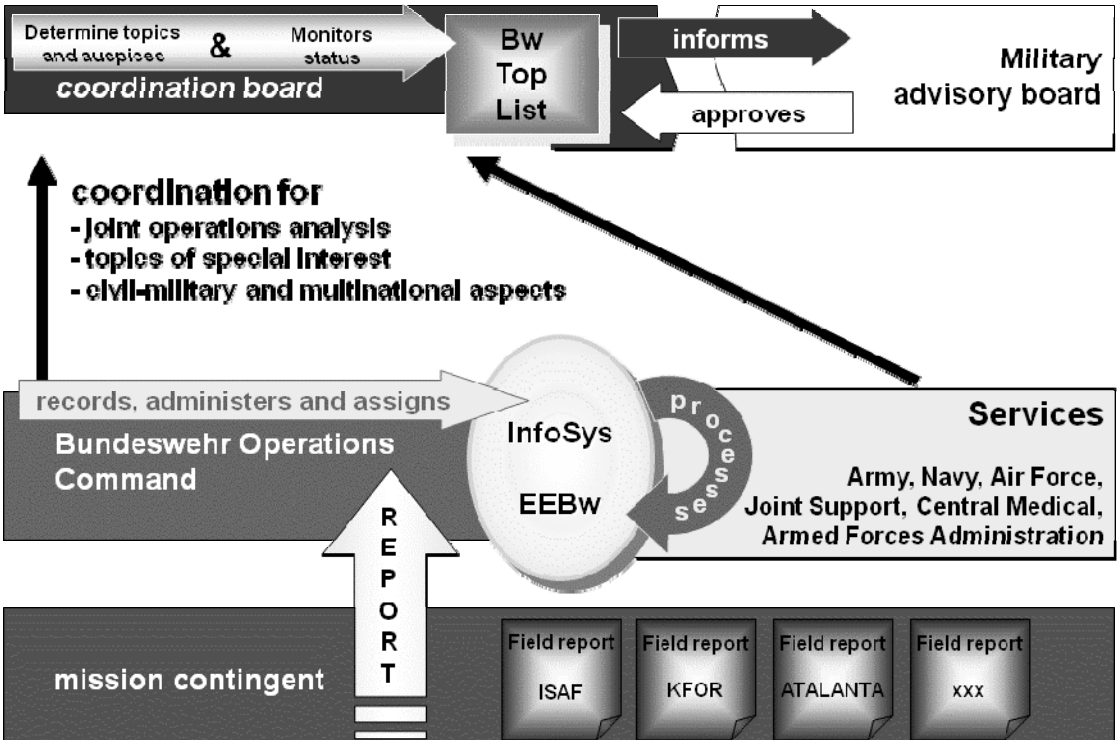

Figure 3: Operations Analysis of the Bundeswehr

As shown in Figure 3, the Bundeswehr depends more than ever on a frictionless flow of information within and between the services to function effectively. However, the research suggests that the critical facilitating factor climate of openness, which would be of utmost importance under these conditions, is not as strong as other factors. Especially, built-in information barriers found in the Army directive potentially hamper effective organizational learning. The directive states that the authority to release new knowledge and making it available as lesson learned lies solely with the executive staff of the German Army. Furthermore, the

executive staff and the Army Forces Command determine who contributes to problem-solving and generating new knowledge. This limits the participants who have rich learning opportunities and many potentially important views.

There are many ways to overcome these barriers and develop a more agile and adaptive Army. One could be to restructure the Bundeswehr's lessons learned process as a whole and implement a new institution similar to the U.S. Army Center for Army Lessons learned (CALL) at Fort Leavenworth. This new institution could be co-located with the Bundeswehr Transformation Center in Straußberg as was suggested by the van-Heyst report.[74] However, a more cost-effective approach seems to be more feasible.

1. An independent lessons learned center in theater, posted on a case by case basis, could facilitate rapid collection and dissemination of lessons learned and avoids involvement of the Bundeswehr Operations Command. The chain of command over the Bundeswehr Operations Command would be involved, too. However, the primary focus in theater would lie on lessons learned and best practices to conduct operations more effectively.
2. The utilization of Web 2.0 technologies could virtually flatten the lessons learned architecture and speed up the learning cycle.

Flat Lessons learned Architecture

Generally, all military units of the Bundeswehr at home and in theater have access to the information system EEBw. However, the release of knowledge and its classification as 'lesson-learned' does not occur until the Ministry of Defense approves it. Until then, only departments that are concerned with evaluating identified lessons and departments concerned with processing

[74] Rolf Clement, "Von wegen 'Joint Forces': eine siebenköpfige Kommission ehemaliger hochrangiger Generale und Admirale hat die Organisation und Befehlsstruktur der Auslandseinsätze analysiert," *Loyal: Magazin für Sicherheitspolitik*, no. 3 (2008): 18-19.

and monitoring have full access to the information.[75] The idea behind this approach is presumably to ensure that only thoroughly examined and valuable lessons learned are disseminated. The crux is that the value of information related to a potential lesson learned may be interpreted differently in theater than in Germany and the examination of an identified lesson may be facilitated by the contribution of more problem-solvers.

The transformation of the Bundeswehr has led to an organization that is being constantly restructured. Furthermore, there is no end in sight because one of the key features of transformation and adaptive organizations is that they constantly adapt to the needs of their environment. The implications of constantly adapting for knowledge transfer are dramatic because it demands from personnel to be regularly relocated either due to regular reassignments or for transformational reasons. Officers and non-commissioned officers often receive new assignments every two years. Eventually, the frequent replacement of personnel takes its toll on organizational learning activities because somebody who was perfectly acquainted with a specific problem may no longer be working in the department in charge of the examination of an identified lesson. When the employee was transferred, he took his tacit knowledge with him. This is of course a challenge many organizations have to deal with. When people leave a company to find a different job they usually take their knowledge with them. Companies try to counter these issues with rigid documentation. Research shows, however, that no documentation is comprehensive enough to substitute for the employee with his tacit knowledge. On the contrary, the German Army has the advantage that the employee is still in the same organization. He is, nevertheless, just working for some reason in another part of the organization and his tacit knowledge is still accessible. However, as has been observed, there are information boundaries in place that make it difficult or even impossible to contact that person officially. It depends on his

[75] Einsatzführungskommando der Bundeswehr, *Standing Operating Procedure (SOP) für die Durchführung Bundeswehrgemeinsamer Auswertung von Einsätzen und einsatzgleichen Verpflichtungen* (Berlin: July 2008), 8.

successor, the new expert; whether he makes informal use of the fact that he could ask the former expert.

One way to tackle this barrier to learning is to promote a more comprehensive climate of openness by avoiding the chain of command and implementing an organization wide network for interpretation and dissemination of identified lessons. Three examples shall illustrate the effect of such collaborative tools. NASA implemented an agency-wide commercial social networking site and after a pilot program proved successful, NASA experienced immense improvement in sharing, problem solving, and transparency into decision-making. "Ninety-three percent of the questions posted online were answered by NASA colleagues throughout the country,"[76] explained one NASA official. And in July 2009, the U.S. Army began encouraging its personnel from privates to generals to go online and collaboratively rewrite seven of the field manuals that give instructions on all aspects of Army life. The program uses the same software that is behind the well-known online encyclopedia Wikipedia. The U.S. Army's stated goal is to tap more experience and advice from battle-tested soldiers rather than relying on the specialists within the Army's array of colleges and research centers who have traditionally written the manuals.[77] At the same time, U.S. Navy officials adopted Web 2.0 tools such as Facebook and Wikipedia on its network to give teams an enhanced way to collaborate. The Navy deployed, however, their own versions of those technologies.[78]

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[76] K.C. Jones, "NASA Succeeds with Social Networking," *Information Week*, February 27, 2009, http://www.informationweek.com/story/showArticle.jhtml?articleID=215500006 (accessed September, 2009).

[77] Bill Ackerly, "US Army Announces Test of Wikis to Revise Tactics, Techniques and Procedures," *The official homepage of the United States Army*, June 30, 2009, http://www.army.mil/-newsreleases/2009/06/30/23722-us-army-announces-test-of-wikis-to-revise-tactics-techniques-and-procedures/ (accessed September 12, 2009).

[78] Doug Beizer, "Navy examines Web 2.0 tech for use on internal networks," *Washington Technology*, March 4, 2009, http://washingtontechnology.com/articles/2009/03/04/navy-web-20.aspx (accessed September 12, 2009).

Although the term Web 2.0 suggests a new version of the World Wide Web, it does not refer to an update or to any technical specifications, but rather to cumulative changes in the ways software developers and end-users use the Internet. Consequently, so called Web 2.0 tools are tools that facilitate interactive information sharing, interoperability, and collaboration. Prime examples are the video sharing network YouTube, the social network Facebook, and the encyclopedia Wikipedia. The U.S. Army's approach to working on field manuals with a tool called *milWiki* seems to be especially promising for working collaboratively on identified lessons.[79] The lesson identified will be developed on intranet pages that are marked as ongoing discussion. Authenticated users could contribute to lessons identified where these users deem changes are necessary no matter where they are assigned to in the Bundeswehr organization. These discussions on changes and suggestions should be accessible to everyone. To ensure the quality of lessons learned and best practices, only information that is being released by a moderator at the executive staff of the German Army at the Ministry of Defense, will be published to the official front page. However, what is key, is that as many as possible contributors have access to the information behind the officially released front page that provides background information and enables a collaborative search for solutions. Allowing all users to contribute to an identified lesson stored on the wiki would dramatically broaden the body of acquired knowledge on operational experiences. This effort would also virtually flatten the lessons learned architecture and speed up the learning cycle because basically every organization member could be invited to contribute to generate new knowledge regardless where he or she is working in the organization.

[79] Josh Davidson, "MilWiki receives Army's top knowledge management honor," *The official homepage of the United States Army*, September 1, 2009, http://www.army.mil/-news/2009/09/01/26836-milwiki-receives-armys-top-knowledge-management-honor/ (accessed September 12, 2009).

Rapid Collection and Dissemination in Theater

The second suggestion is to implement an independent lessons learned center in theater, posted on a case by case basis that could facilitate rapid collection and dissemination of lessons learned and avoids involvement of the Bundeswehr Operations Command. The Bundeswehr established a basis for that when the Bundeswehr introduced the concept of theater observer officers in 2007 to accompany the introduction of new materiel and to relieve troops on the ground from documenting relevant lessons learned while utilizing a new weapon system. [80] The focus of theater observer officers in the Bundeswehr is to provide operational insights for further analysis and training for troop-contributing services. The Bundeswehr Operations Command's SOP states; "Theater observer officers analyze operations and specific events in a way that documentation can be used for further analysis and is suitable for training of troop-contributing services."[81] The introduction of theater observer officers is clearly helping to speed up the learning cycle, however, it does not assist the contingent in theater to develop and disseminate lessons learned. While in past missions, learning was done mainly before and after the mission contingent's term, another example singles out a way to learn from operational experience in quasi real-time.

Facing a highly adaptive enemy during the Lebanon war in 2006,[82] the Israeli Defense Force decided to speed up their learning cycle in order to keep up with the adaptive abilities of Hezbollah.[83] The Israeli Defense Force formed a Center for Army Lessons learned, which

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[80] Michael Kämmerer, "Qualitätsmanagement der Streitkräfte," *Denkwürdigkeiten: Journal der Politisch-Militärischen Gesellschaft*, no. 38 (2007): 5.

[81] Einsatzführungskommando der Bundeswehr, *Standing Operating Procedure (SOP) für die Durchführung Bundeswehrgemeinsamer Auswertung von Einsätzen und einsatzgleichen Verpflichtungen* (Berlin: July 2008), 10.

[82] O. A. Jackson et al., *Aptitude for destruction: Organizational learning in terrorist groups and its implications for combating terrorism* (RAND: no. 1, 2005).

[83] Gil Ariely, "Learning to digest during fighting – Real time knowledge management," http://www.ict.org.il/Articles/tabid/66/Articlsid/229/currentpage/9/Default.aspx (accessed August 9, 2009).

"collected, analyzed and dispersed operational knowledge and lessons learned in real-time amongst fighting forces."[84] The center gathered knowledge gained from each day's operations, printed digests, and distributed these down to company level by the next day.

To achieve the Israeli level of collecting and disseminating of lessons learned requires experienced full-time observer officers working in theater. Building a temporary center for lessons learned (TCLL) or creating a detachment from the J3 cell could significantly speed up the learning in theater during major operations or other significant events. The TCLL must have the authority to interpret and disseminate deficiencies, identified lessons and best practices theater-wide. The temporary center for lessons learned (TCLL) could rapidly generate lessons learned while connected with dispersed troops and the home base via the suggested milWiki. Lessons learned and best practices could be distributed daily online via the milWiki and in person through briefings by observer officers. German troops are at the moment regularly deployed in four month terms, key personnel six months or longer. Therefore, another advantage would be that a TCLL could be deployed on a different cycle and serve as memory of the contingent.

Conclusion

The transformation of the Bundeswehr pooled services into the Joint Support Service and the Central Medical Services and led to a capabilities-oriented concept that demands significantly more coordination between the services. The new structure produced a more distributed structure for the Bundeswehr's lessons learned system as well. Consequently, the Bundeswehr pursues an integrated and joint approach for collecting, interpreting and disseminating lessons learned from operational experiences under auspices of the Ministry of Defense. Field reports and the van-Heyst-report concluded that the Bundeswehr does not learn effectively from its operational experiences and that there are factors that are barriers to learning.

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[84] Gil Ariely, "Learning to digest during fighting – Real time knowledge management," http://www.ict.org.il/Articles/tabid/66/Articlsid/229/currentpage/9/Default.aspx (accessed August 9, 2009).

Organizational learning concepts and many publications on knowledge management and learning organizations discuss normative factors that facilitate learning in an organization such as an involved leadership, a systems perspective, an awareness of a performance gap, a concern for measurement, organizational curiosity, a climate of openness, and multiple advocates. All facilitating factors are found in the Bundeswehr's formal lessons learned process. One can conclude the lessons learned system provides the necessary and sufficient conditions that allow learning to emerge and flourish. However, the research shows that the actual dissemination of lessons learned does not occur until the Ministry of Defense approves it. Until then, only departments that are concerned with evaluating and departments concerned with processing and monitoring have full access to the information. While reports with shortcomings are written in an open und frank style, there are at the same time strong information barriers and only few participate in the learning process. In contrast, given the new structure the Bundeswehr actually depends more than ever on a frictionless flow of information within and between the services to function effectively.

One way to tackle the barriers to learning is to promote a more collaborative climate of openness by implementing an organization wide network for interpreting and disseminating of identified lessons. While in past missions learning was done mainly before and after the mission contingent's term, a temporary center for lessons learned could rapidly generate lessons learned while connected with dispersed troops and the home base via a milWiki. Thus, the Army could speed up its learning cycle dramatically. Flattening the information relationships would allow many more soldiers to contribute and collaborate accessing in the process. The effects of personnel turn over would be mitigated if not solved and the burden on the deployed contingent to document relevant lessons learned would be eased.

BIBLIOGRAPHY

Ackerly, Bill. “US Army Announces Test of Wikis to Revise Tactics, Techniques and Procedures.” *The official homepage of the United States Army*. June 30, 2009. http://www.army.mil/-newsreleases/2009/06/30/23722-us-army-announces-test-of-wikis-to-revise-tactics-techniques-and-procedures/ (accessed on September 12, 2009).

Alberts, David S., and Richard E. Hayes. *Power to the Edge*. Information Age Transformation Series, published by the Command and Control Research Program (CCRP). Washington, D.C.: June 2003.

Argyris, Chris, and Donald Schön. *Organizational Learning: A Theory of Action Perspective*. Reading, MA et al.: Addison-Wesley Publishing Company, 1978

Ariely, Gil. “Learning to digest during fighting – Real time knowledge management.” http://www.ict.org.il/Articles/tabid/66/Articlsid/229/currentpage/9/Default.aspx (accessed August 9, 2009)

Axelrod, Robert, and Michael D. Cohen. *Harnessing Complexity*. New York: Basic Books, 2000.

Barrett, Frank J., and Keith F. Snider. *Dynamics of Knowledge Transfer in Organizations: Implications for Design of Lessons learned Systems*. Montery, CA.: Naval Postgraduate School, April 12, 2001.

Beizer, Doug. “Navy examines Web 2.0 tech for use on internal networks.” *Washington Technology*. March 4, 2009. http://washingtontechnology.com/articles/2009/03/04/navy-web-20.aspx (accessed September 12, 2009).

Bertalanffy, Ludwig von. *General Systems Theory*. New York: George Braziller Inc., 1968.

Bundesministerium der Verteidigung. *Konzeption der Bundeswehr (KdB)*, Berlin: August 19, 2004.

Bundesministerium der Verteidigung. *ZDv 10/1 Innere Führung. Selbstverständnis und Führungskultur der Bundeswehr*. Bonn: January 28, 2008.

Bundesministerium der Verteidigung. *Weisung für die Weiterentwicklung der Bundeswehr*. Berlin: October 23, 2003.

Bundesministerium der Verteidigung, Inspekteur des Heeres. *Weisung zur Weiterentwicklung des Heeres (WWH). 1. Änderung*. Bonn: May 2005.

Bundesministerium der Verteidigung. *Weisung zur Auswertung von Einsätzen, einsatzgleichen Verpflichtungen und Übungen im Heer*. Bonn, March 22, 2007.

Bundesministerium der Verteidigung. *Weisung für die Auswertung von Einsätzen der Bundeswehr*. Berlin: August 3, 2009.

Bundesministerium der Verteidigung. *Allgemeiner Umdruck 1/100 – Handbuch für Auslandseinsätze im Frieden*. Version 22. February 19, 2008.

Clement, Rolf. “Von wegen ‘Joint Forces’: eine siebenköpfige Kommission ehemaliger hochrangiger Generale und Admirale hat die Organisation und Bundeswehrstruktur der Auslandseinsätze analysiert.” *Loyal: Magazin für Sicherheitspolitik*. Vol. 3, 2008.

Davidson, Josh. “MilWiki receives Army's top knowledge management honor.” *The official homepage of the United States Army*. September 1, 2009. http://www.army.mil/-news/2009/09/01/26836-milwiki-receives-armys-top-knowledge-management-honor/ (accessed September 12, 2009).

DiBella, Anthony J. and Edwin C. Nevis. *How Organizations Learn: An Integrated Strategy for Building Learning Capability*. San Francisco: Jossey-Bass, 1998.

Dixon, Nancy M. *Common Knowledge*: *How Companies Thrive by Sharing What They Know*. Boston, MA.: Harvard Business School Press, 2000.

Einsatzführungskommando der Bundeswehr. *Standing Operating Procedure (SOP) für die Durchführung Bundeswehrgemeinsamer Auswertung von Einsätzen und einsatzgleichen Verpflichtungen*. Berlin: July 2008.

Einsatzführungskommando der Bundeswehr. *Einsatzführungskommando der Bundeswehr*. 3rd ed. Berlin: August 2007.

Gall, Carlotta. "Kabul Bombing Kills 4 German Soldiers and Wounds 29." *New York Times*. June 8, 2003. http://www.nytimes.com/2003/06/08/international/middleeast/08KABU.html (accessed August 9, 2009).

Garvin, David A. *Learning in Action: A Guide to Putting the Learning Organization to Work*. Boston, MA.: Harvard Business School Press, 2000.

German Federal Ministry of Defense. *White Paper 2006*. Berlin: 2006.

Hatch, Mary Jo. *Organization Theory*. Oxford: University Press, 1997.

Jackson, O. A., et al. *Aptitude for destruction: Organizational learning in terrorist groups and its implications for combating terrorism*. RAND: Volume 1. 2005.

Jones, K.C. "NASA Succeeds with Social Networking." *Information Week*. February 27, 2009. http://www.informationweek.com/story/showArticle.jhtml?articleID=215500006 (accessed September 12, 2009).

Kämmerer, Michael. "Qualitätsmanagement der Streitkräfte". *Denkwürdigkeiten: Journal der Politisch-Militärischen Gesellschaft*. Vol. 38, July 2007.

Krake, Lutz. "Einsatzführungsstab – Ziele, Aufgaben, Fähigkeiten, Strukturen." *Hardthöhenkurier: das Magazin für Soldaten*. Vol. 6, 2008.

Marahrens, Sönke et al. "Experimentieren für die Zukunft der Bundeswehr." *Europäische Sicherheit: Politik, Streitkräfte, Wirtschaft, Technik*. Vol. 7, 2008.

Marquardt, Michael J. *Building the Learning Organization*: *A Systems Approach to Quantum Impovement and Global Success*. New York et al: McGraw-Hill, 1996.

McGill, Michael E., and John W. Slocum. *The Smarter Organization: How to Build a Business That Learns and Adapts to Marketplace Needs*. New York et al.: John Wiley & Sons Inc., 1994.

McGrath, John. *An Army at War – Change in the Midst of Conflict*, Fort Leavenworth: Combat Studies Institute Press, 2005.

Mirvis, Philip H. "Historical Foundations of Organization Learning." *Journal of Organizational Change Management*. Vol. 9, Issue 1. Bradford: 1996.

Schneiderhahn, Wolfgang. "Transformation der Bundeswehr. Verbesserung der Einsatzfähigkeit." *Der Mittler Brief, Informationsdienst zur Sicherheitspolitik*. Vol. 20, No. 1, 2005.

Struck, Peter. "Fit für veränderte Aufgaben – Die Transformation nimmt Gestalt an." *Europäische Sicherheit: Politik, Streitkräfte, Wirtschaft, Technik*. Vol. 54, No. 1, 2005.

Senge, Peter et al. *The Fifth Discipline Field Book*. New York et.al: Doubleday, 1994.

Senge, Peter M. *The Fifth Discipline: The Art & Practice of The Learning Organization*. New York: Currency Doubleday, 1994.

Schneiderhahn, Wolfgang. “Der Einsatz bestimmt die Wirklichkeit des Bundeswehr-Alltags.” *Die Bundeswehr: Magazin des Deutschen Bundeswehrverbandes e.V.* Vol. 12, 2006.

Szandar, Alexander. “German Troops Bemoan 'Critical' Deficits in Training and Equipment.” *Spiegel online international*. August 31, 2009. http://www.spiegel.de/international/world/0,1518,646085,00.html (accessed September 4, 2009).

Weber, R., et al. “Intelligent lessons learned systems.” *International Journal of Expert Systems Research & Applications.* Vol. 20, No. 1, 2001.